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I, JULIE BILLINGSLEY, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2003905823 for a patent by COMALCO ALUMINIUM LIMITED as filed on 22 October 2003.

WITNESS my hand this
Fourth day of November 2004

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PATENT REQUEST : PROVISIONAL APPLICATION

We, being the persons identified below as the Applicants, request the grant of a patent for an invention described in the accompanying provisional specification.

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Address:	15TH FLOOR, 12 CREEK ST. BRISBANE, QUEENSLAND 4000 AUSTRALIA
Invention Title:	DESTROYING ORGANICS IN BAYER LIQUOR STREAMS
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Our Ref: GRM:BK:P50313

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DESTRUCTION OF ORGANICS IN BAYER PROCESS STREAMS

The present invention relates to destroying organic compounds, hereinafter referred to as "organics", in Bayer process streams.

The Bayer process is the dominant technology for the extraction of refined alumina from alumina process feedstocks.

In the Bayer process alumina is extracted from alumina process feedstock (most frequently in the form of bauxite) by digesting milled alumina process feedstock in hot caustic solution, generally under pressure. If the alumina process feedstock contains mainly gibbsite (a mineral form of alumina trihydrate), extraction of alumina from the bauxite may be conducted using a caustic solution at a temperature generally in the range 100 to 175°C. If the alumina process feedstock contains mainly boehmite, or diaspore (mineral forms of aluminium monohydrate) higher temperatures, in the order of 200 to 300°C are generally required.

After digestion, the solid residue/pregnant caustic liquor mixture is brought back to atmospheric pressure by flashing to boil off water. The solid residue (usually referred to as red mud) is separated from the pregnant, caustic aluminate bearing liquor, usually by a combination of settling or filtration and washing, with both pregnant liquor and wash liquor clarified through pressure filters.

The clarified combined liquor is fed to a precipitation circuit where it is cooled and seeded with solid particles of alumina trihydrate to induce precipitation of solid aluminium trihydrate crystals from the liquor.

The resulting precipitation slurry is separated into a spent liquor stream and solids streams graded by particle size, by settling, cycloning or filtration, or combination of these processes.

Coarse solids represent product, and are washed and transferred to a calcination stage where they are calcined to produce alumina.

Intermediate and fine solids are separately returned as seed to the precipitation circuit, frequently after at least crude de-liquoring, e.g. in cyclones or filters, for agglomeration and to provide seed.

The intermediate and fine seed are normally washed prior to recycle to precipitation, either to remove solid phase oxalate precipitated with the alumina (which would interfere with the incorporation of the fine material into composite coarse particles in the precipitation process) and/or to remove organics which would otherwise render the seed less active.

The spent liquor is returned to the digestion step, normally after some reconcentration by evaporation, where it is contacted with further milled alumina process feedstock.

In general terms, the above-described Bayer process can be summarised as a process which comprises the basic steps of (a) digesting alumina process feedstocks in sodium hydroxide; (b) precipitating aluminium trihydrate from a process stream produced in step (a); and (c) calcining the precipitate to produce alumina, and may include further steps in addition to steps (a), (b), and (c).

The liquors produced in step (a) and the subsequent steps are hereinafter referred to generally as "Bayer liquors".

The Bayer process has been used commercially for about 100 years and is well known to persons skilled in the art.

A major problem with all Bayer plants is the build up of harmful organics in Bayer liquors.

Harmful organics originate from contamination in the bauxite ore mined such as from plant and animal matter and, under the high temperatures and strongly alkaline conditions of the bauxite digestion step, these organics enter Bayer liquors.

A wide range of organics are present, especially humates. Humates reduce the productivity of Bayer plants through contaminating the surfaces of precipitated aluminium tihydrate crystals and slowing down the crystallization rates.

A number of processes have been proposed to remove these organics, with liquor burning and wet oxidation being the most favoured processes. These are both expensive and have severe disadvantages in either only removing some of the organics (wet oxidation) or in having difficulties with unwanted emissions of part oxidized species (liquor burning).

The present invention is based on the realisation that the use of ultrasonic energy is an alternative option for removing organics from Bayer liquors. This technique can be applied directly to the liquors or can also advantageously be used to destroy organic compounds present on the surfaces of the precipitated aluminium

trihydrate crystals (hereinafter referred to as "particles").

Accordingly, the present invention provides a Bayer process, as described above, which includes treating Bayer liquors and/or precipitated aluminium trihydrate particles , as described above, with ultrasonic energy to destroy organics circuit and reduce the amount entering the Bayer liquors.

The above-described treatment step may be carried out on Bayer liquors and particles from any part of the Bayer process or on side streams of the Bayer liquors.

The treatment step is advantageously carried out on Bayer process streams with liquors and particles that contain relatively high concentrations of organics compared to other Bayer liquors and particles.

One particularly suitable Bayer process stream liquor is Bayer liquor containing intermediate and fine seed that are separated from the precipitation slurry from the precipitation step of the Bayer process. The seed particles have raised levels of organics attached to the surfaces of the seed crystals. In most Bayer plants, the organics are washed from the surfaces and the wash liquor, which is high in organics, becomes a waste stream of the process. The wash step is costly, because of the loss of valuable sodium hydroxide. Treating these seed particles prior to washing the organics from the surface, and/or the resultant wash liquor, in a suitable ultrasonic unit allows destruction of the harmful organics and avoids the need to discharge valuable liquor. With this method more organics destruction and hence removal from the circuit can be achieved than is affordable using conventional treatment and discharge of the wash liquor. The method is much simpler and more economical than the use of wet

oxidation or liquor burning.

Preferably the ultrasonic energy is in the form of pulses of ultrasonic energy that cause cavitation in Bayer liquor or at the surface of the paricles.

The term "cavitation" is understood herein to mean the formation of bubbles that grow and implosively collapse in the liquor or at the particle surface thereby producing intense localised heating and high pressures and high heating and cooling rates that cause chemical and physical reactions within the region of the collapsed bubbles.

The above-described chemical and physical reactions within the regions of the collapsed bubbles cause the destruction of organics in those regions.

Many modifications may be made to the present invention described above without departing from the spirit and scope of the invention.

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